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Original article

Obesity predisposes to increased drainage following axillary node clearance: a prospective audit

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***Background*: Whilst sentinel node biopsy is being evaluated for optimising treatment of the axilla, axillary dissection remains the gold standard. Seroma formation, a common sequel to axillary dissection, has been shown to be associated with an increased incidence of wound infection, delayed healing, and lymphoedema. This study was conducted to evaluate the possible contributory role of obesity in axillary drainage following lymphatic dissection.**

***Patients and Methods*: This study comprised a prospective review of all patients undergoing axillary dissection in conjunction with mastectomy or wide local excision. The total in-patient axillary drainage and the average daily drainage was correlated with various clinical parameters, including obesity, type of surgery, level of axillary dissection and nodal involvement. The body mass index (BMI) was used as a measure of obesity.**

***Results*: During a 6-month period, axillary dissection was performed in 79 women. Nineteen patients were excluded. Patey mastectomy was performed on 33 (55%) and the remaining had breast conservation. The amount or duration of axillary drainage did not correlate with the type of operation, tumour histology, level of axillary dissection or the nodal status. Higher BMI correlated with increased mean daily axillary drainage and total volume drained, whilst in hospital. (Spearman correlation coefficient 0.42; $P < 0.01$).**

***Conclusion*: Obesity predisposes to increased axillary drainage following nodal clearance.**

Key words: Axillary dissection – Complications – Obesity

Breast surgery is known to have a major impact on women's physical and psychosexual well-being.[1] Prolonged postoperative morbidity due to a persistent axillary drainage – or 'seroma' formation – undermines early rehabilitation and return to a 'normal' life. This study was conducted to examine the various

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factors that may potentially affect postoperative axillary fluid drainage.

Patients and Methods

This study comprised a prospective review of all patients undergoing axillary dissection in the form of a modified radical mastectomy or in conjunction with wide local excision for proven breast cancer. All patients were weighed (kg) on admission and their height (m) recorded. All mastectomy patients had two standard closed-suction drains inserted at the end of the operation – draining the breast and the axilla. Others had only a single drain in the axilla. The total in-patient axillary drainage and the average daily drainage were recorded for each patient whilst in hospital. Any post-operative morbidity (*e.g.* wound infection) was recorded. There was no operative mortality in the study group. The volume of axillary drainage was correlated with the following clinical parameters: (i) obesity (BMI); (ii) type of surgery; (iii) level of axillary dissection; and (iv) nodal involvement.

The patients' body mass index (BMI) was used as a measure of obesity. This was calculated by incorporating the following formula into an Excel® spreadsheet:

$$\text{BMI} = \text{Weight in kg} / (\text{Height in m})^2 \qquad \text{Eq. 1}$$

Women with a BMI greater than 30 kg/m^2 were considered obese for the purpose of this study. This was equal to grade 2 and 3 obesity based on the WHO Expert Committee on Physical Status classification.

Statistical methods

The standard SPSS® software package was used for statistical analyses. The Spearman's non-parametric correlation coefficient was computed for each variable and a two-tailed significance obtained. A positive correlation coefficient suggested a linear relationship between the drainage volume and BMI. Correlation curves were obtained for variables that reached statistical significance. An independent *t*-test was used to compare the average daily drainage in the BMI <30 kg/m^2 and BMI > 30 kg/m^2 groups. A P value <0.05 was considered significant.

Results

During a 6-month period, between November 1995 and May 1996, 79 women underwent axillary dissection for histologically proven carcinoma of the breast. Nineteen patients were excluded from the study due to following reasons: (i) previous surgery in the axilla; (ii) previous radiotherapy to the axilla; and (iii) previous or current primary breast reconstruction.

Table 1 Clinicopathological profile

(n = 60)	Minimum	Maximum	Median
Age (years)	36	90	62.38
Height (m)	1.50	1.75	1.62
Weight (kg)	43.5	103.0	69.5
BMI (kg/m^2)	19	42	27
Total I-P* drainage (ml)	130	3190	1146
Average daily drainage (ml)	–	778	159
I-P stay (days)	3	17	8.3
Total no. of nodes excised	2	24	11.6
No. of positive nodes	0	14	1.2

*I-P = in-patient.

Table 2 Level of axillary dissection

	No. of patients	Percentage
Level 1	11	18
Level 2	7	12
Level 3	42	70
Total	60	100

The clinicopathological data are detailed in Table 1.

A total of 36 patients had a total mastectomy and the rest had conservative excision. All patients had axillary dissection and level 3 nodal clearance was performed in over two-thirds of patients. The breakdown of the axillary levels is detailed in Table 2. Invasive ductal carcinoma was the predominant histology (82.2%) as detailed in Table 3.

The patients' BMI values ranged from 19–42 kg/m^2 (mean, 26.83 kg/m^2; SD 4.71 kg/m^2). BMI was unavailable

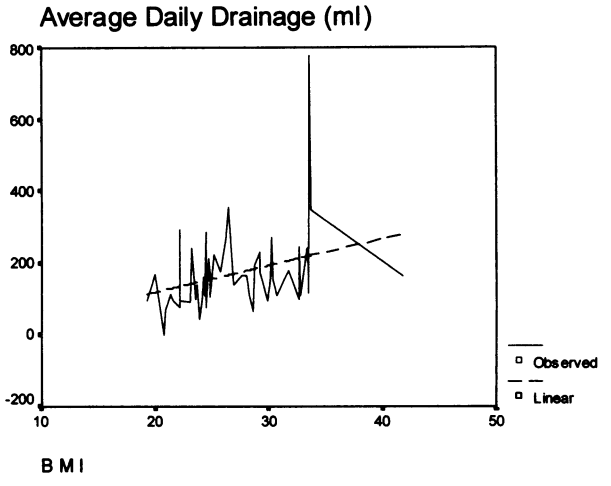

Figure 1 Curve showing relationship between average daily drainage and BMI.

Table 3 Histological subtypes

Histology	No. of patients	Percentage
Ductal carcinoma (NOS)	50	83.2
DCIS	3	5.0
Lobular carcinoma	4	6.7
Papillary intracystic carcinoma	1	1.7
Tubular carcinoma	1	1.7
Colloid carcinoma	1	1.7
Total	60	100.0

Table 4 Comparison between obese and non-obese patients

	Total drainage (Mean, ml)	Daily drainage (Mean, ml)
BMI < 30 kg/m^2	1145	152
BMI > 30 kg/m^2	1299	219

Table 5 Factors not significantly affecting axillary drainage

Factor	No. of patients	Mean volume (SD) (ml)	*P* value
Age			
< 60 years	24	133 (76)	0.549
≥ 60 years	36	175 (128)	
Type of operation			
Mastectomy	24	152 (59)	0.102
Conservation	36	178 (141)	
Level of axillary dissection			
1	11	146 (82)	0.463
2	7	152 (45)	
3	42	171 (123)	
Nodal status			
Node –ve	39	172 (122)	0.728
1–3 +ve	15	148 (51)	
> 3 +ve	6	159 (137)	

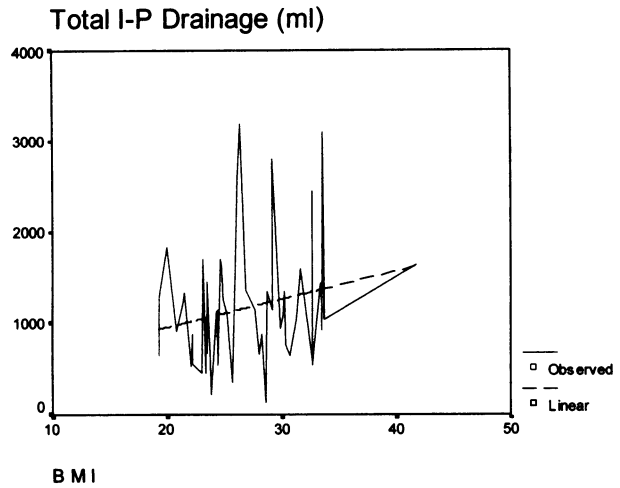

Figure 2 Curve showing relationship between total drainage and BMI.

for 8 women. Of the remaining 52, 37 (71%) were below the cut-off BMI of 30 kg/m^2. Obesity data were correlated with daily mean axillary drainage and total in-patient drainage volume.

A positive correlation coefficient of 0.42 suggested a linear relationship between the drainage volume and BMI (Figs 1 & 2). This was found to be statistically significant ($P < 0.01$). This indicated that a higher BMI (or increasing obesity) predisposed to increased axillary drainage among the patients studied. Further analysis between obese (BMI > 30 kg/m^2) and 'non-obese' women, using the *t*-test, showed a significantly higher drainage values among the obese patients ($P < 0.05$; Table 4).

The average volume or duration of axillary drainage did not, however, correlate with any of the following (see Table 5): (i) patients' age group; (ii) the type of operation; (iii) level of axillary dissection; or (iv) nodal status.

Patients who were excluded from the study ($n = 19$) had all received interventions that are known to alter the breast and axillary pathophysiology. As this could potentially confound the results, it was decided not to include them in the analysis.

Two patients suffered minor wound infection, which was treated with oral flucloxacillin. Another patient had to be re-admitted for intravenous antibiotics for septicaemia, which was treated successfully.

Discussion

A common sequel to axillary dissection is seroma formation. Axillary seroma has been shown to be associated with an increased incidence of wound infection, delayed wound healing, and lymphoedema.[1] Various factors have, hitherto, been considered responsible for prolonged axillary drainage and subsequent seroma formation. Seroma formation in the axilla requiring aspiration occurs in up to 42% of patients treated without drainage. Prolonged out-patient suction drainage reduces, but does not eliminate, the incidence of seroma formation, while increasing cost, discomfort, and possibly infection rates.[2] Early removal of axillary drains (within 24 h postoperatively) has been reported to reduce the incidence of seroma formation and facilitate early discharge.[2-4] These studies did not, however, account for the co-morbidity of obesity.

Petrek *et al.* evaluated the role of obesity and other factors in axillary morbidity among 57 women undergoing axillary dissection.[1] They reported that the only two factors predicting greater drainage were large numbers of positive lymph nodes and no previous surgical biopsy. In the context of long-term effects, Werner *et al.* studied 282 patients with stage I or 11

breast cancer who received radiation after conservative management of breast cancer.[5] They concluded that factors which related to patient size, such as body mass index, were strongly associated with both the frequency and severity of arm oedema.

The current study, with 60 patients, shows a statistically significant correlation between obesity and axillary drainage. This is particularly relevant to surgeons practising in industrialised nations faced with the ever-increasing problem of obesity. Recent studies have shown that obesity (grades 1–3) affects over half the adult population in many countries.[6] In a randomised trial by Forouhi *et al.* involving 75 patients, obesity emerged as a significant risk factor for postmastectomy complications ($P = 0.015$).[7]

Although axillary dissection is followed by seroma formation, less aggressive axillary surgery, *e.g.* nodal sampling, results in minimal morbidity. Judging by the level of international interest in axillary lymphatic mapping or sentinel node biopsy (SNB), minimal access to axillary nodes appears to be the way forward. Whilst the results of large randomised trials, such as the NSABP-SLND trial in the US and the ALMANAC trial in the UK, are eagerly awaited, surgical oncologists are already adopting SNB as the standard clinical practice, having proven their competence in the procedure.[8]

Given the results of the current study and the others quoted above, it may be suggested that obese patients would be more suitable for minimal access surgery. Until more data are available, it seems prudent that patients with a BMI above 30 kg/m^2, who undergo axillary dissection, should be counselled regarding the higher risk of postoperative axillary complications.

Conclusions

This study suggests that obesity plays a contributory role in increased drainage following nodal clearance. In the current context of minimal axillary morbidity by employing techniques such as sentinel node biopsy, this is yet another point in favour of the latter. Furthermore, this study may be useful to most surgeons who are commonly faced with the prospect of operating on obese patients. These patients may, perhaps, be forewarned of the possibility of prolonged axillary drainage and the need for repeated percutaneous drainage of axillary seromas.

Acknowledgement

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